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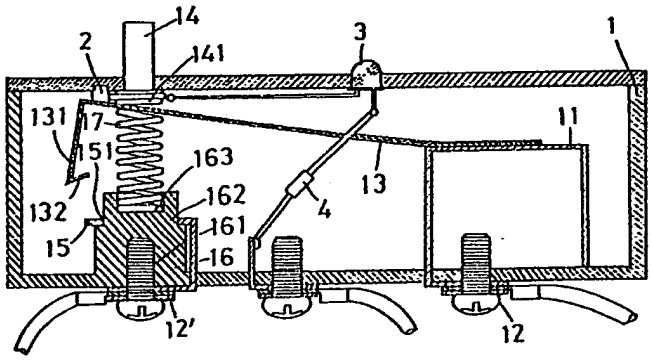
(54) Automatic circuit breakers

(57) An automatic circuit breaker has a push button 14 to press a bimetal strip 13 so that a hook 132 at an end of the bimetal strip can keep contact with a contact 15 to complete an electrical circuit between two terminals 12, 12'. The hook 132 can trip automatically at overload. A spring 17 pushes against the bimetal strip 13 so that it will not restore to its original position after tripping.

FIG. 2



GB 2 177 543 A

FIG. 1

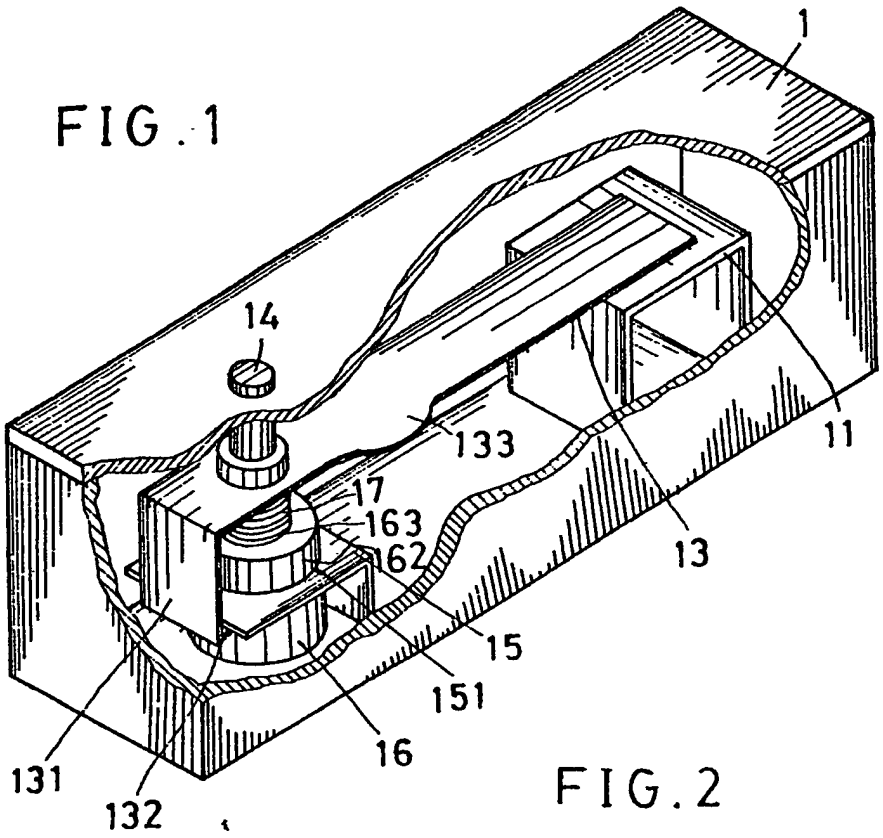

1
14
133
11
17
163
162
13
15
151
16
131
132

FIG. 2

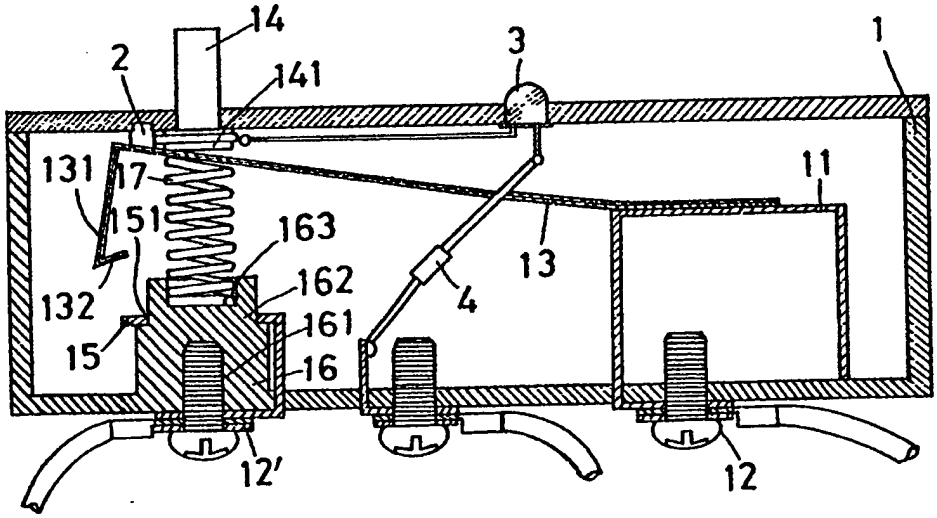

14
2
141
3
1
131
17
11
151
163
13
162
4
132
161
15
16
12'
12

FIG. 3

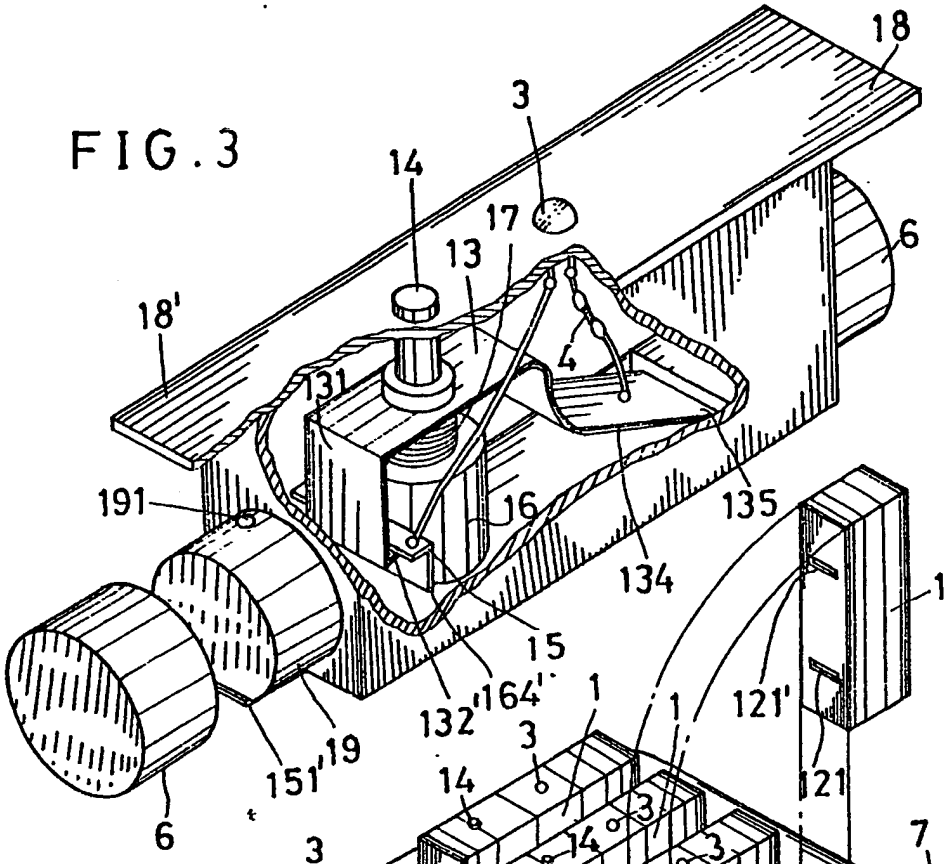
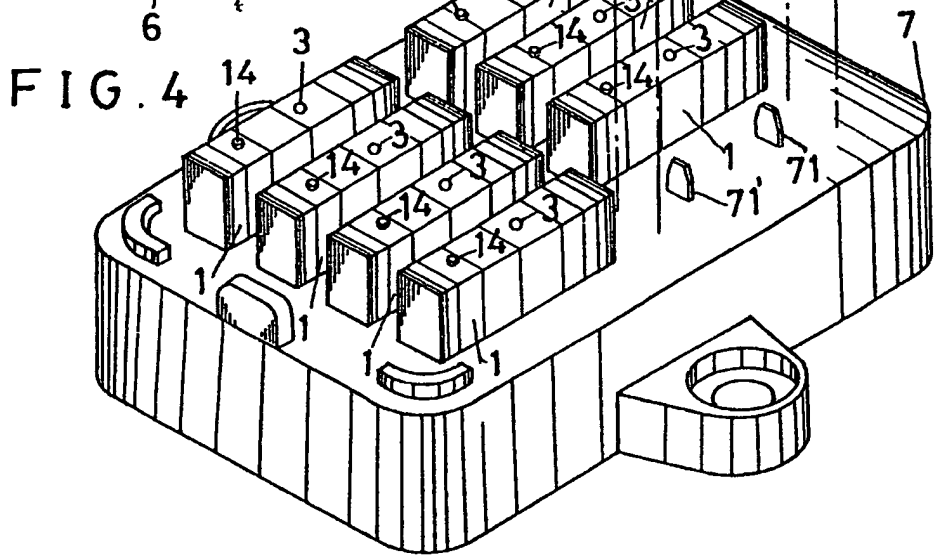

18
3
14
17
13
6
18'
4
131
191
16
135
134
1
15
164'
132'
121'
19
151'
121
6

FIG. 4


7
14
3
1
71
71'

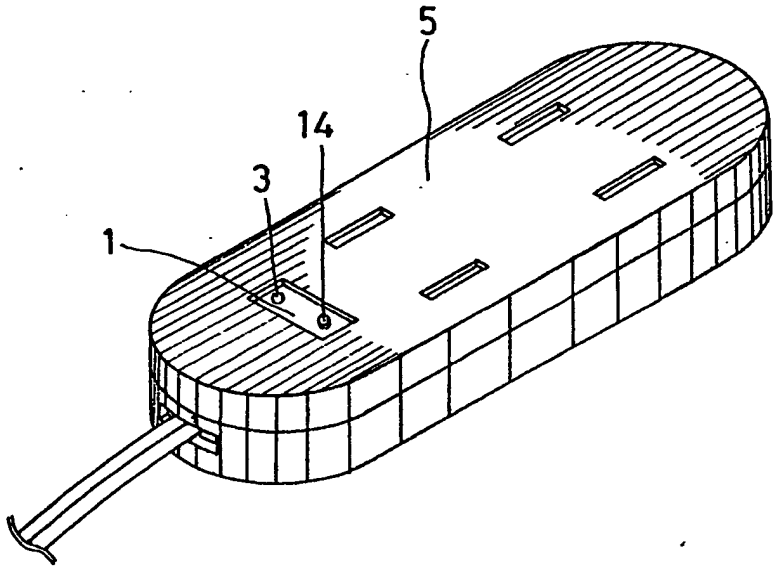


FIG.5

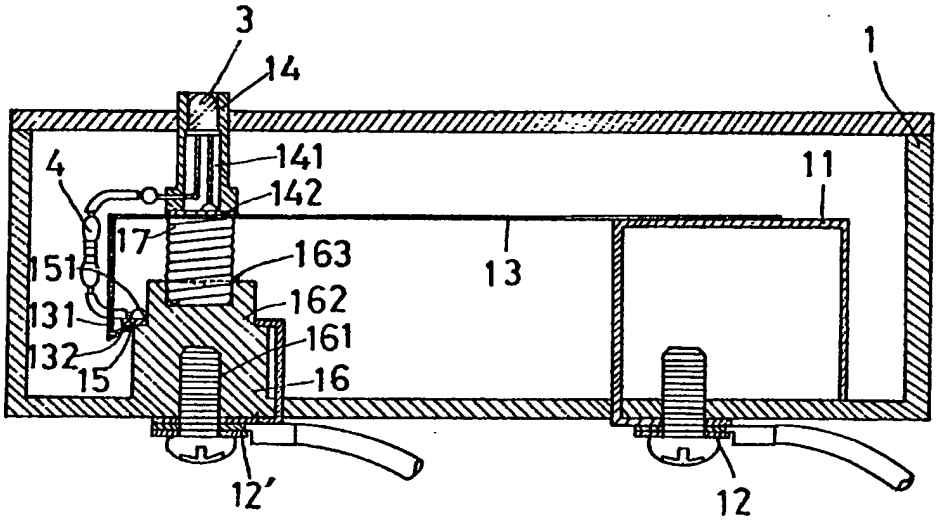


FIG.6

515

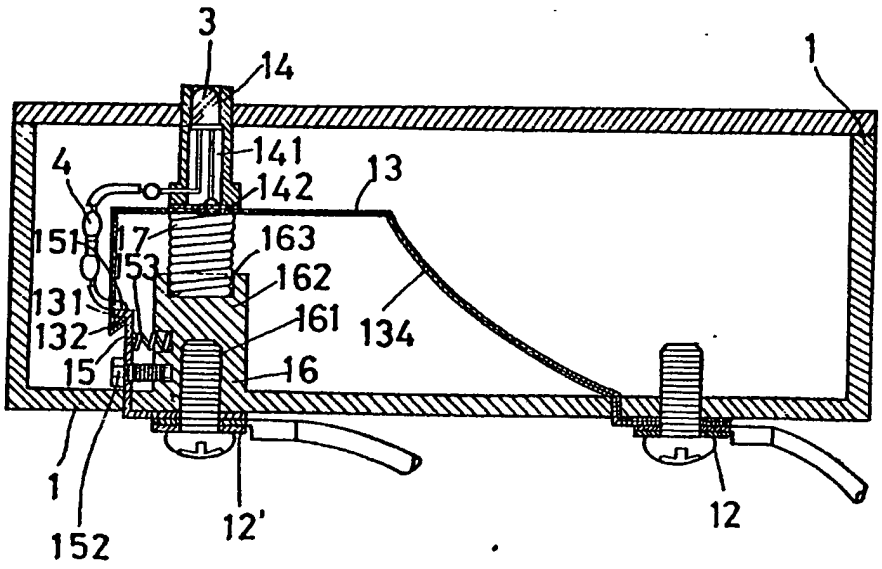

3
14
1
141
4
142
13
151
17
163
153
162
131
161
134
132
15
16
1
152
12'
12

FIG.7

SPECIFICATION

Automatic ircuit breakers

The present invention relates t automatic circuit breakers, particularly an overload protection device to be used on electronic products and electrical appliances to replace the conventional fuse and expensive breaker.

The conventional fuse is used as overload protection device for electrical appliances since it can cut off power supply at overload. However, it's quite inconvenient to replace a burnt fuse. Therefore, generally, no-fuse breaker is installed at main power switch to avoid frequent replacement of fuses and to act as an overload protection device. Since no-fuse breaker is large in volume and expensive in cost, it can't fully replace the conventional fuse. Though small automatic breaker has been developed, its volume is still not small enough and its price is high, it is not suitable for low-priced or small electrical appliance. A newly developed tripper for use on motorcycle which is said an overload protection device still can't perform well for protection purpose at short circuit or overload but burns wire or electric appliance. The inventor has devoted himself at research and development of overload tripper for years. The present invention is his achievement after times of failure, and hundreds of test. Its volume has been minimized and its cost has been minimized too. The present invention has been proven a reliable and economic automatic circuit breaker.

Disclosed herein is an automatic circuit breaker comprising a metal frame connecting with terminals for wiring within its main body, a bimetal strip connected with the metal frame, a hook at an end of the bimetal strip to hold contact for maintaining conductivity and for tripping automatically at overload, a spring to push against the hook so that it will not restore its original position after cooling and a push button to apply pressure to the spring so that the bimetal strip can has its hook held the contact again.

According to the invention, we propose an automatic circuit breaker including first and second terminals, a bimetallic strip for breaking the electrical connection between the terminals, a contact for supporting and electrically connecting one end of the bimetallic strip with the first terminals, means for depressing the bimetallic strip against biassing means into the normal circuit-connecting position, one end of the bi-metallic strip being held against the contact of the first terminal in the depressed position of the bimetallic strip by action of the biassing means, such that upon release of the bimetallic strip, the circuit is broken and the bimetallic strip is biassed away from the first terminal.

Preferably, the bimetallic strip has a hooked portion for engaging with a protrusion on the first terminal. More preferably, the bimetallic strip is substantially L-shaped with a major limb, a minor limb and hook at th end of th minor limb.

An embodiment of Automatic Circuit Breaker according to this inv ntion is described by way of example, with refer nce t th drawings in which:

Figure 1 is a perspectiv view of a preferred embodiment for th present invention;

Figure 2 is a persp ctive vi w of another preferred embodiment f r the present inventi n with a troubl indicat r;

Figure 3 is a perspective vi w of another preferred embodiment for the present invention, fuse type;

Figure 4 illustrates structure of a fuse holder for automobile;

Figure 5 is a perspective view of a conventional socket with the present invention;

Figure 6 is a perspective view of a preferred embodiment for the present invention which places a LED on a push button;

Figure 7 is a sectional view of a preferred embodiment for the present invention which places a LED on a button and for application in large current.

Figure 1 is a perspective view of preferred embodiment for the present invention at normal condition. Within its main body (1) there is a metal frame (11) connecting with a terminal (12) for wiring (refer to Figure 2). On the top of the metal frame there is a bimetal strip (13) which has an end turned 90° downwards and a hook (132) at that end. While the bimetal strip (13) is pressed downwards, the hook (132) moves from above a contact (15) to engage the underneath of the contact (15) and is then held thereat. The contact is passing through a screw hole at the bottom of a fixing block (16) and connecting with another terminal for wiring (12'). The fixing block (16) has a column (162) on its top for inserting into a hole (151) of the contact (15) and fixed it to the column (162). At the middle of the column (162) there is a recession (163) for containing a spring (17). An end of the spring (17) is pushing against the bimetal strip (13) so that the bimetal strip (13) will not restore its position after it is tripped due to overload, and to keep the contact (15) contacting with the bimetal strip (13) closely for maintaining a good conductivity while the hook (132) of the bimetal strip (13) is held by the contact (15), and for maintaining the conductivity by holding them together while there is a strong vibration, but tripping them at overload.

The present invention has a push button (14) which is fixed to the main body by a flange (14). While the bimetal strip (13) has to be repositioned after tripping, the pushed button (14) is pressed to apply pressure on the bimetal strip (13) and a spring (17) so that the bimetal strip (13) is held by the contact (15) again.

As illustrated at Figure 1, the bimetal strip (13) has a sector (133) at an appropriate position to cause a powerful tripping at overload. Another form of the bimetal strip (13) is shown in Figure 3. It has a downward arciform position (134) at an appropriate position to cause powerful tripping. One or more small groove may be made on the bimetal strip (13) to increase tripping force. In order to maintain a good contact between the bimetal strip (13) and the contact, the present invention applies a spring (17) to keep th m contacting with each oth r cl sely. Furthermore, the contact surfaces on th bim tal strip (13) and contact (15) are of gilt or silver plated, or designed with platinum contacts to prevent from oxidization due to heating which may cause poor contact.

Figure 2 is a perspecive view of an ther preferred

embodiment for the present invention with a trouble indicator. Except the trouble indicator, its structure is substantially similar to that shown in Figure 1, and therefore, only the trouble indicator will be described below. The bimetal strip (13), after tripping, contacts with a block (2), which, together with a LED (3) and a resistor (4), connects to a terminal in series, and the terminal is to another line of the power source, so that LED (3) lights as a warning signal after the bimetal strip (13) is tripped.

Figure 3 is a perspective view of another preferred embodiment for the present invention, a fuse type with trouble indicator. Its structure is substantially similar with that illustrated in Figure 2, and only the difference will be described below. The LED (3) and resistor (4) is connected between the two terminals (12) and (12'). While the bimetal strip (13) is held by the contact (15), the potential across the LED (3) and the resistor (4) is zero, the LED (3) does not light. But after the bimetal strip (13) is tripped, a closed circuit among a line of the power source, load, resistor (4), LED (3), contact (15) and another line of the power source is formed so that the LED (3) lights as a warning of overload. If the present invention breaks down, the terminals (12) and (12') will never allow the contact (15) to hold the bimetal strip (13) and the LED (3) gives a warning light.

Figure 3 is a perspective view of an preferred embodiment for the present invention in fuse type. Cylindrical columns (19) are designed at both ends of the main body (1). The contact (15) is passing through a hole (164) so that an end of the contact (15) is extending along the surface of each column (19), and ends of the bimetal strip (13) are extending along the surfaces of such column (19) too. On the surface of the column (19) there are ribs (191) as shown in Figure 3 so that the column can be firmly covered by cap (6) or (6'). Protective plates (18) and (18') are designed at both sides on the top of the columns to prevent from shocking while it is placed on any fuse holder.

Figure 4 illustrates a fuse type overload tripper for application in car. At such an application, a fuse holder (7) with some pairs of plugs (71) and (71') is used. Sockets (121) and 121') are designed to replace the terminals so that the plugs (71) and (71') on the fuse holder (7) can be inserted into and fixed to the sockets (121) and (121') respectively. Or, plugs may be designed on the overload tripper and corresponding sockets are designed on the fuse holder (7).

For application on motorcycle, the overload tripper as disclosed herein can use plugs instead of the terminals.

The present invention can be used in any electronic device, electric applicance or socket, switch for automatic tripping and warning at overload.

Figure 5 shows how it is used on an ordinary power socket. The push button (14) and the LED (3) are exposed to make its bimetal strip re-positioning easy and for indicating overload.

The metal frame (11) as shown in Figure 1 can be designed to have a bimetal strip (13) in any position higher than that in Figure 1, or in a form with a downward arciform portion (134) as shown in Figure 3, or replaced by a bimetal.

For convenience purpose, the LED (3) can be placed within a hole (141) at the push botton (14) as illustrated in Figure 6. A terminal of the LED (3) is fixed to a metal plate (142) and the other terminal is connected to the resistor (4) and then the contact (15) in series so that it keeps contact with the metal plate (142) after the bimetal strip is tripped, and so the LED (3) lights after such tripping gives a warning signal. Such a design has a merit of space saving.

The warning device as shown in Figure 3 and Figure 6 applies direct current. If alternating current is used, there must be an additional rectifier/filter curcuit to light the LED, or the LED used shall be that for alternating current.

The present invention can be designed in socket type, pin plug type, plug type to meet any demand. The terminals (12) and (12') can be located either on bottom or side of the main body (1).

The present invention can be realized with or without indicator in any shape to meet market demands.

Figure 7 shows a structure of the present invention for application on large current. Its structure is substantially similar to that shown in Figure 6. Since the bimetal strip (13) requires an additional thickness for application in large current, and the hook (132) of the bimetal strip (13) can hardly slide to the lower end of the contact (15) while pressure is applied on it through the push button (14), the present invention uses a contact (15) which is fixed to the main body so that the contact (15) will move backwards while the hook (132) of the bimetal strip (13) is pressed and thus, the hook (132) can be slided to the lower end of the contact (15) smoothly. Since large current will cause a great variation on action of the bimetal strip (13), and the contact (15) is of slightly moveable, a screw (152) is used to adjust the contact surface between the contact (15) and hook (132) the contact (15) has a spring (153) at its rear end so that the contact can be moved backwards while it is pressed, and the screw (152) will restrict forward declining of the contact (15), and then the bimetal strip (13) can trip easily at overload.

CLAIMS

1. An automatic circuit breaker including first and second terminals, a bimetallic strip for breaking the electrical connection between the terminals, a contact for supporting and electrically connecting one end of the bimetallic strip with the first terminal, means for depressing the bimetallic strip against biassing means into the normal circuit-connecting position, one end of the bimetallic strip being held against the contact of the first terminal in the depressed position of the bimetallic strip by action of the biassing means, such that upon release of the bimetallic strip, the circuit is broken from the first terminal.

2. An automatic circuit breaker comprising: a metal frame connected with a terminal for wiring; a contact, fixed on a column above a fixed block, connected to another terminal for wiring; a bimetal strip, with an end fixed to the metal frame, and another end turning 90° downwards with a hook at its

trip; a spring, placed between a recess n th fixing block and th bimetal strip; a push button, with its bottom contact with th bimetal strip.

3. An aut matic circuit breaker as claimed in claim 2 wh rein th bimetal strip is designed with sector and grooves to increase tripping force.

4. An automatic circuit breaker as claimed in claim 2 wherein the bimetal strip is designed in a form with a downward arciform portion or as an incorporated part of the terminals for wiring to replace the metal frame.

5. An automatic circuit breaker as claimed in claims 2, 3 or 4 wherein the contact sufaces on the bimetal strip and contact are of gilt or silver plated, or have platinum contacts.

6. An automatic circuit breaker as claimed in claim 1 wherein the two terminals for wiring are located at bottom of the overload tripper, or at both ends in the form of cylindrical columns for holding by fuse holder.

7. An automatic circuit breaker as claimed in claim 6 wherein protection plates are used above the two terminals for wiring located at both ends to prevent from shocking.

8. An automatic circuit breaker as claimed in any preceding claim wherein the terminals for wiring can be of socket type, plug type or pin type.

9. An automatic circuit breaker as claimed in any preceding claim, having a device for indicating overload.

10. An automatic circuit breaker as claimed in claim 9 wherein the indicator device comprises a block on the bimetal strip, and the block is connected to an LED, a resistor and a terminal to power source in series so that the LED lights to give a warning signal after the bimetal strip is tripped.

11. An automatic circuit breaker as claimed in claim 9 wherein the indicator device is comprising a LED and a resistor connected to the terminals for wiring in series so that the LED can light to give a warning after the bimetal strip is tripped.

12. An automatic circuit breaker as claimed in claim 9 wherein the LED of the indicator device is located within a hole on the push button, and there is a metal plate below the push button so that it keeps contact with the metal plate and the LED lights after the bimetal strip is tripped.

13. An automatic circuit breaker as claimed in claim 2 wherein the fixing block has a column to fix the contact and there is a recess on the column for containing a spring.

14. An automatic circuit breaker as claimed in any preceding claim for use in electronic products, electrical appliances, sockets, switches and automobiles.

15. An automatic circuit breaker as claimed in claim 2 wherein the terminals for wiring are replaced with two cylindrical columns along which the bimetal strip and contact are extended, ribs are made and over which m tal caps ar cov red firmly in lieu of fuse.

16. An automatic circuit breaker as claimed in claim 2 wherein th contact is fixed to the main body with a spring so that th contact can move backwards while it is pressed, and the spring is used to adjust th contact surface between the contact and th bimetal strip and to restrict the f rward declining of the contact so that th bimetal strip can trip aut matically at verload.

17. An aut matic circuit br ak r substantially as herein described.

18. An automatic circuit breaker constructed and arranged substantially as herein described with reference to any of the drawings.

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